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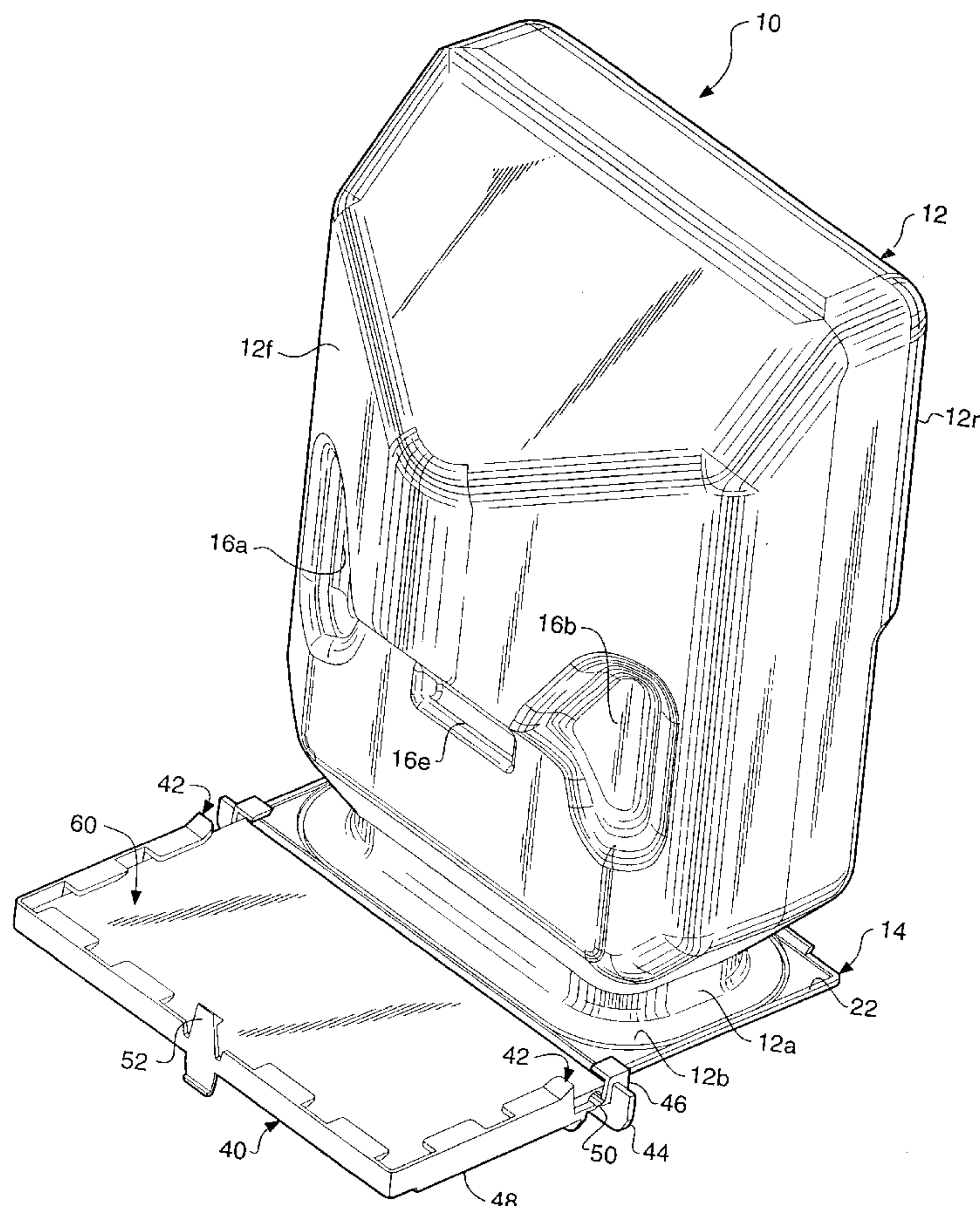
**United States Patent** [19]**Garcia et al.**[11] **Patent Number:** **5,978,624**[45] **Date of Patent:** **Nov. 2, 1999**[54] **SLIDE COVER BREATHABLE SEAL FOR A MARKING PARTICLE RECEPTACLE**[75] Inventors: **Christopher S. Garcia; Ronald R. Holland; Scott H. Schwallie**, all of Rochester, N.Y.[73] Assignee: **Eastman Kodak Company**, Rochester, N.Y.[21] Appl. No.: **09/052,475**[22] Filed: **Mar. 31, 1998**[51] **Int. Cl.<sup>6</sup>** ..... **G03G 15/08**[52] **U.S. Cl.** ..... **399/106; 399/120; 399/260; 399/262; 222/DIG. 1; D18/43**[58] **Field of Search** ..... 399/120, 258, 399/260, 262, 106; 222/DIG. 1, 561; 141/364, 351, 352, 353, 354; 220/351; D18/40, 43[56] **References Cited****U.S. PATENT DOCUMENTS**

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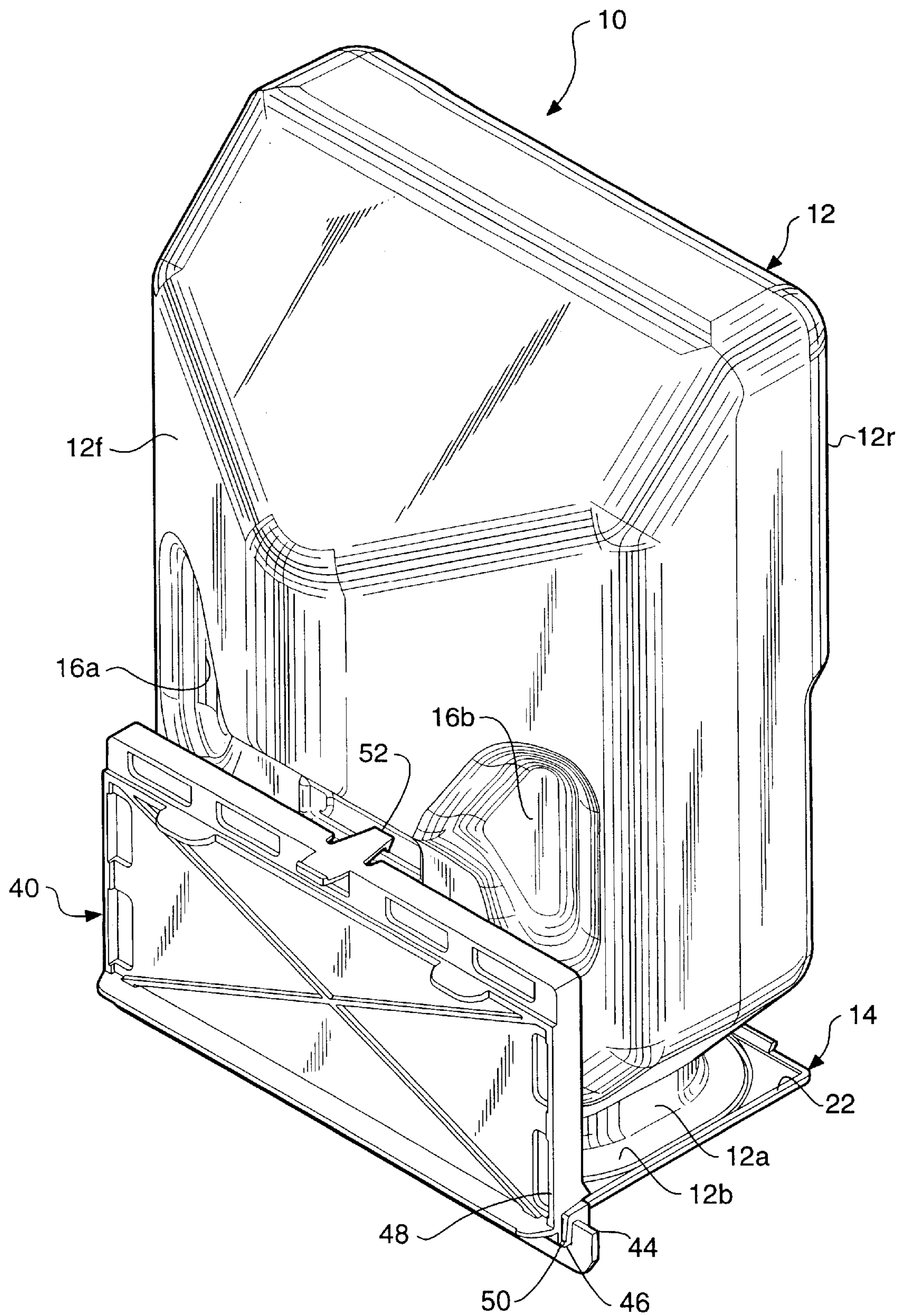
*Primary Examiner*—Matthew S. Smith*Attorney, Agent, or Firm*—Lawrence P. Kessler[57] **ABSTRACT**

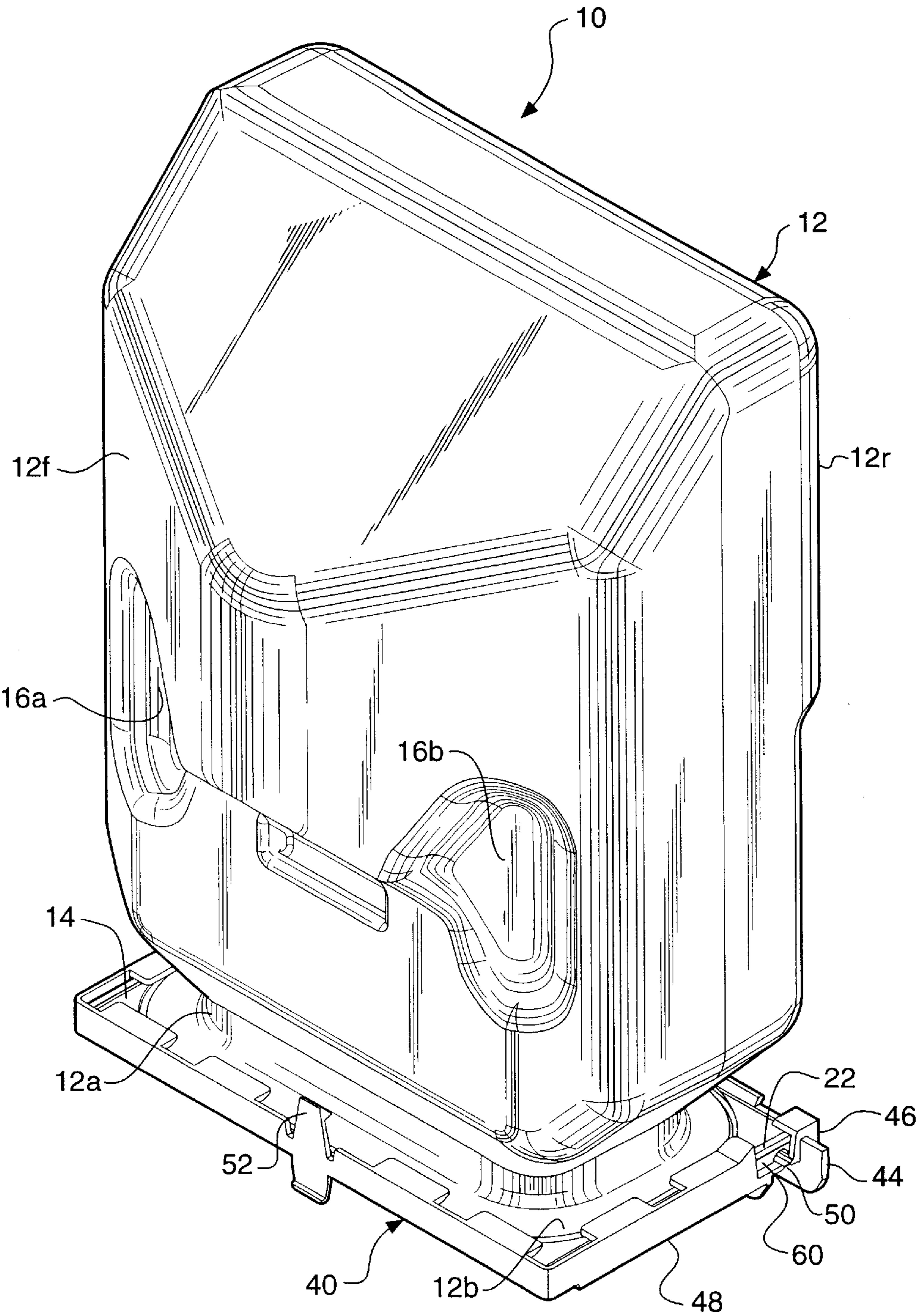
A receptacle for particulate matter to be supplied to a reproduction apparatus. The receptacle includes a container, adapted to store particulate matter, has an opening defined therein. A flange is located about the defined opening so as to facilitate placement and removal of the receptacle with the reproduction apparatus. A breathable seal member is provided having a body portion and a readily accessible end portion. The body portion is bonded to the flange for covering the defined opening. The bond is particularly formed in a pattern of repeating minimum and maximum distances from the defined opening to reduce the forces required to break the bond and remove the breathable seal from the flange.

**6 Claims, 10 Drawing Sheets**





**FIG. 2**



**FIG. 3**

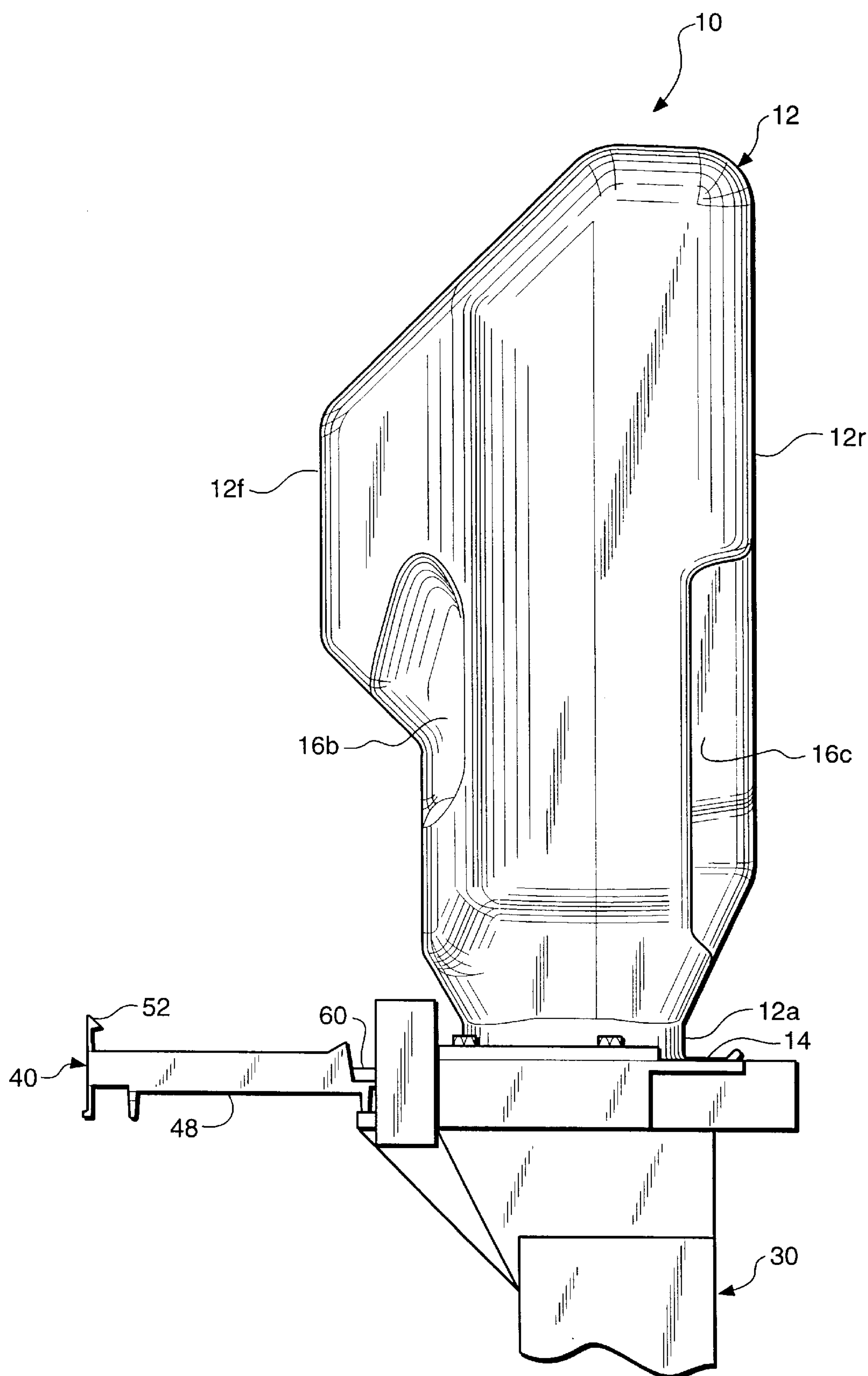
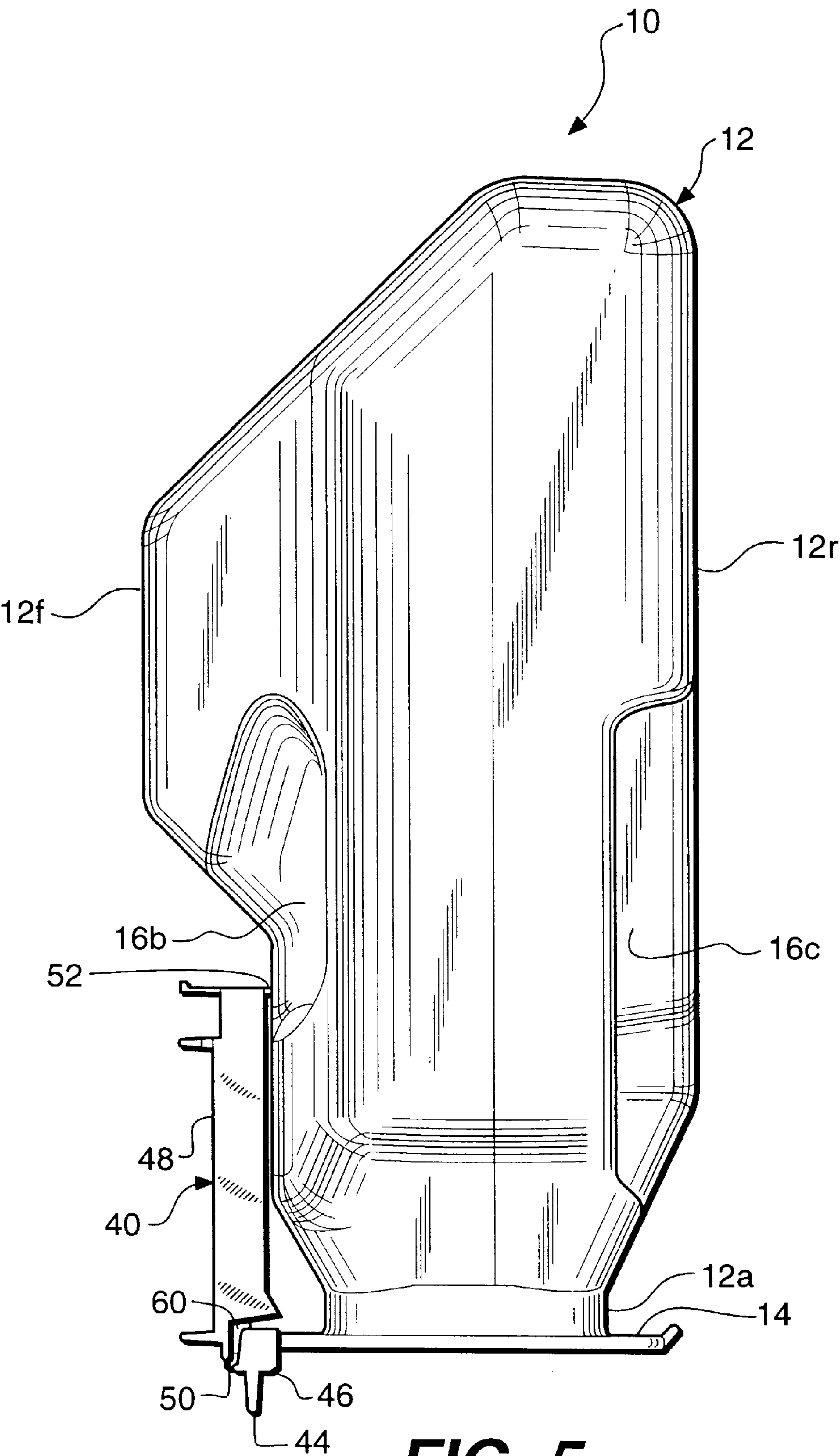


FIG. 4



**FIG. 5**



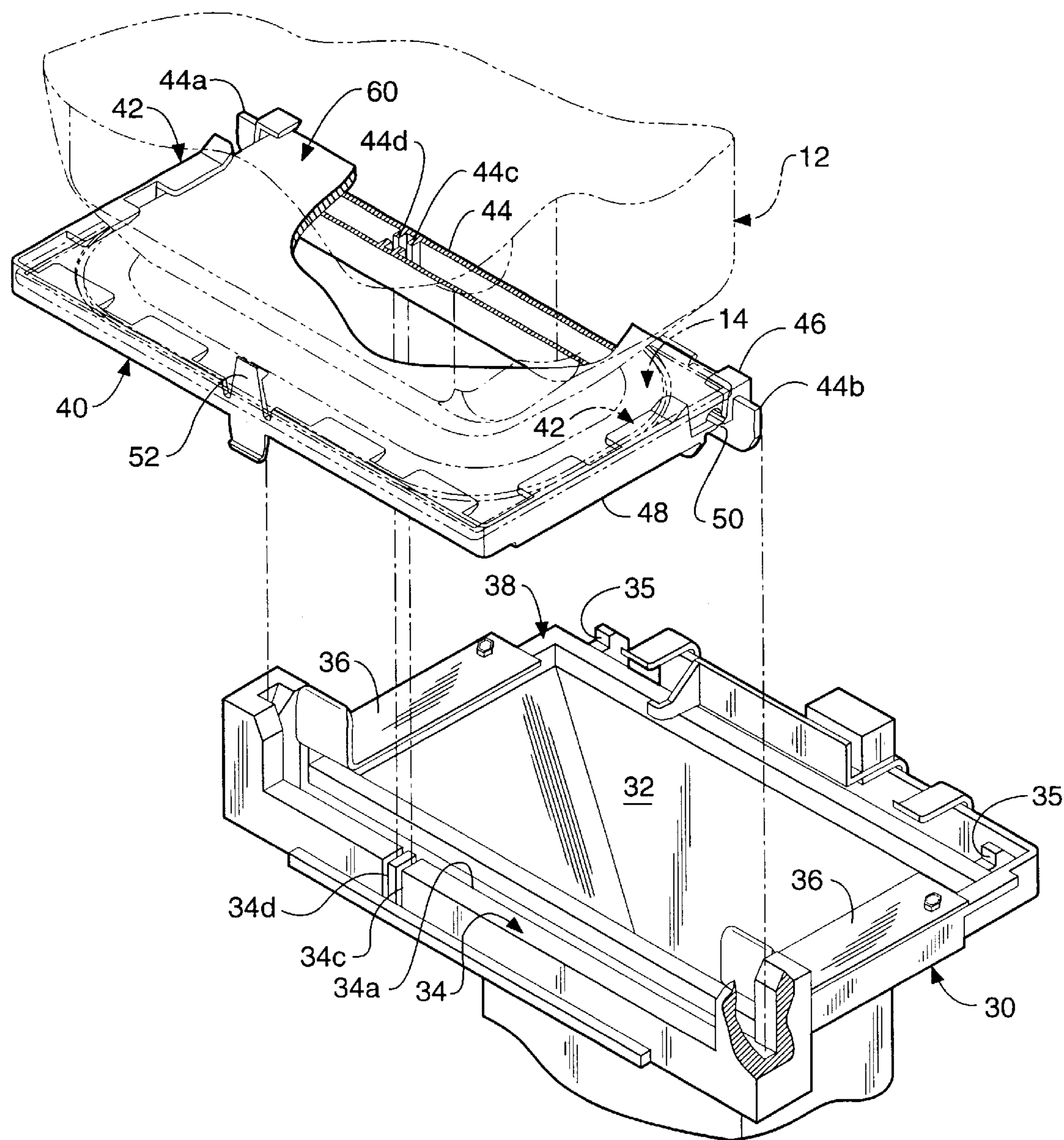
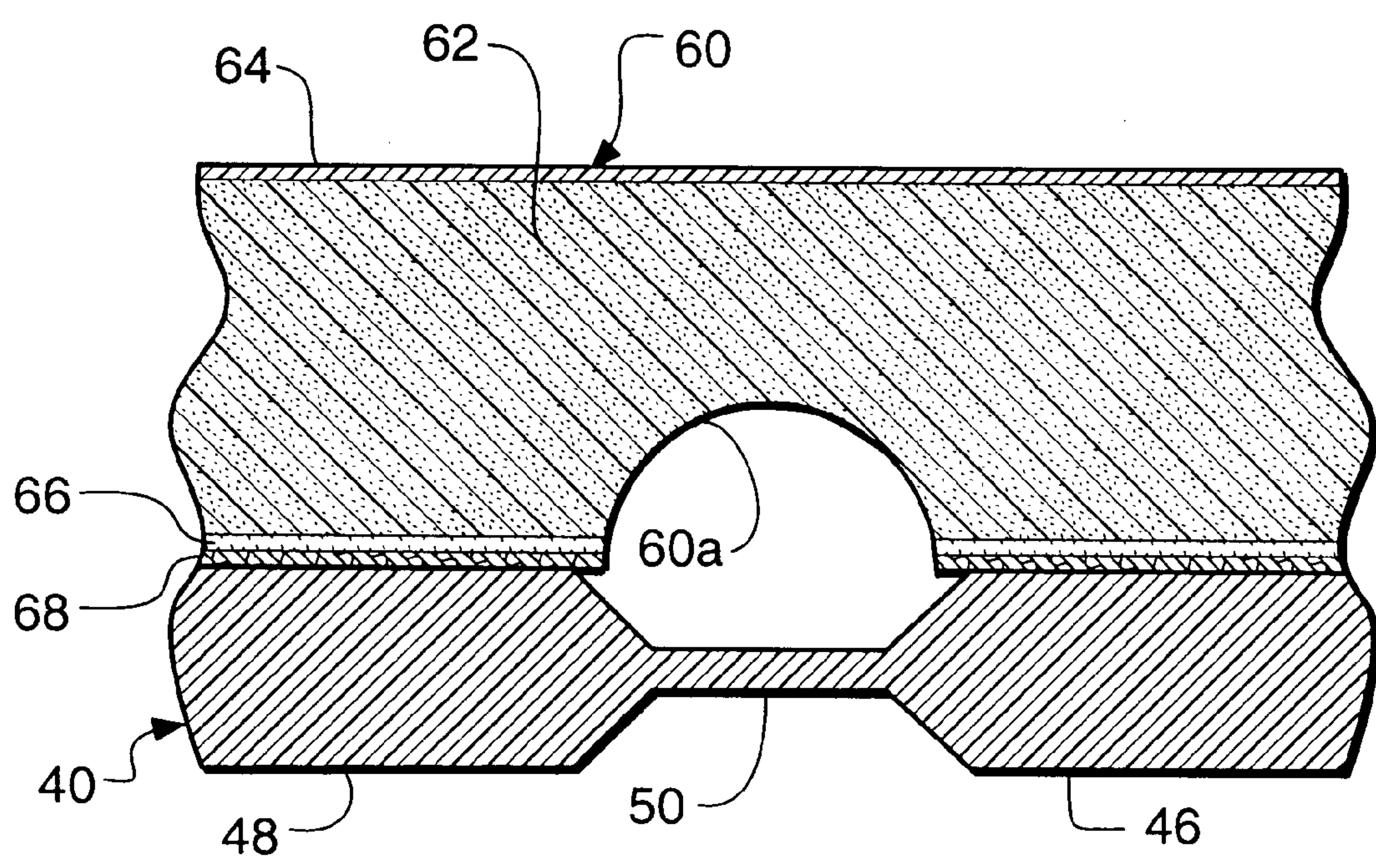
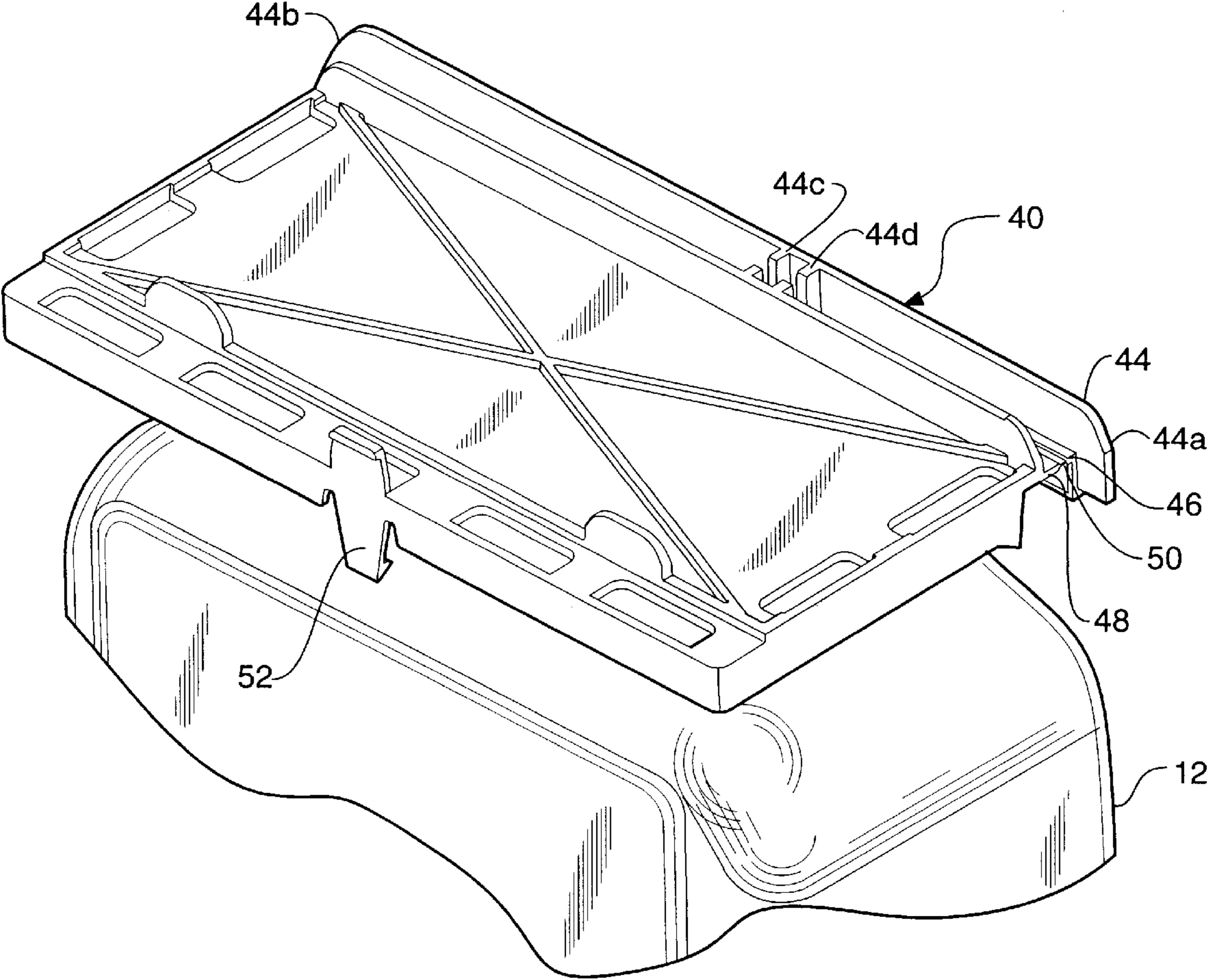


FIG. 6

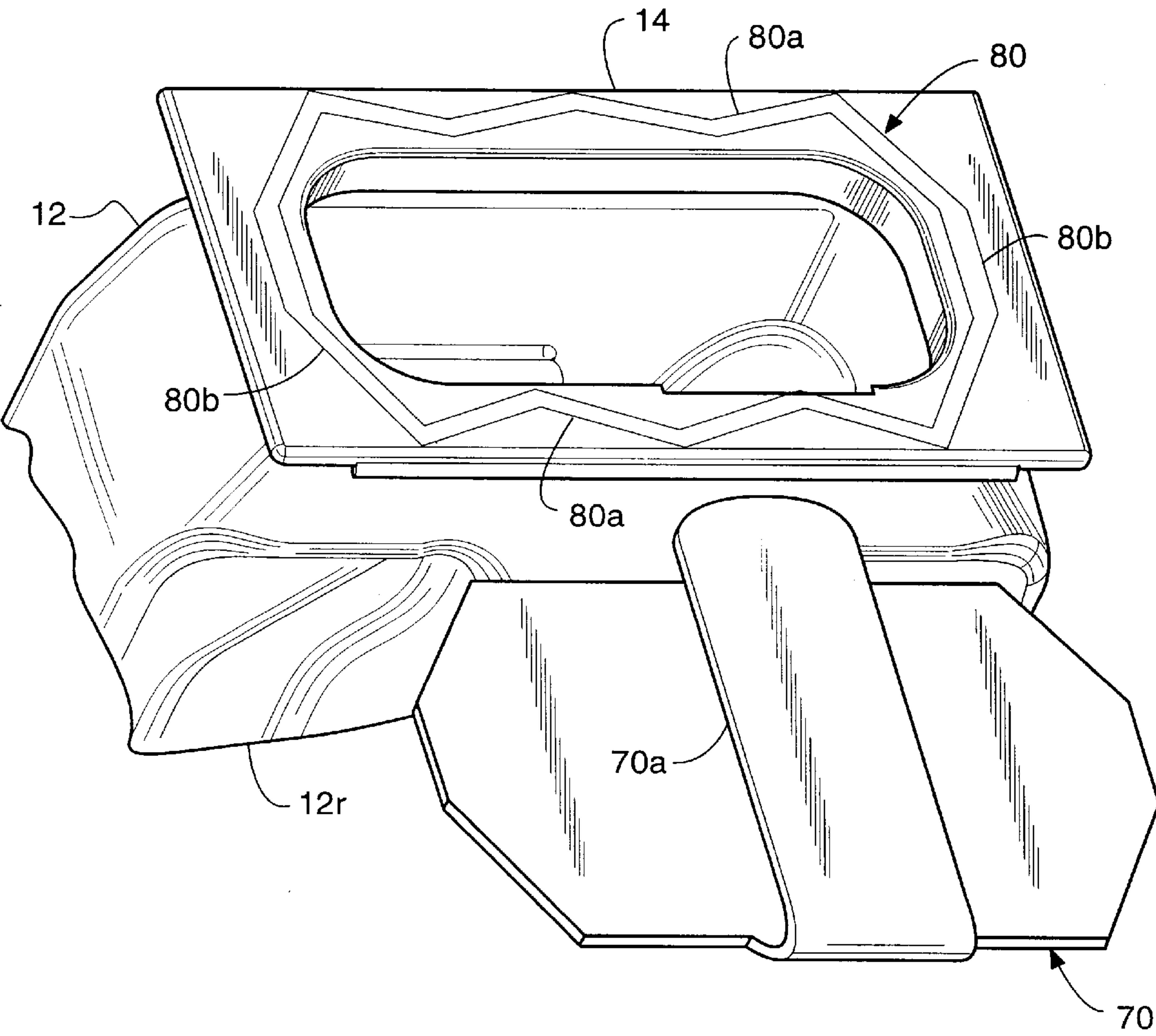


**FIG. 7**





**FIG. 8**



**FIG. 9**

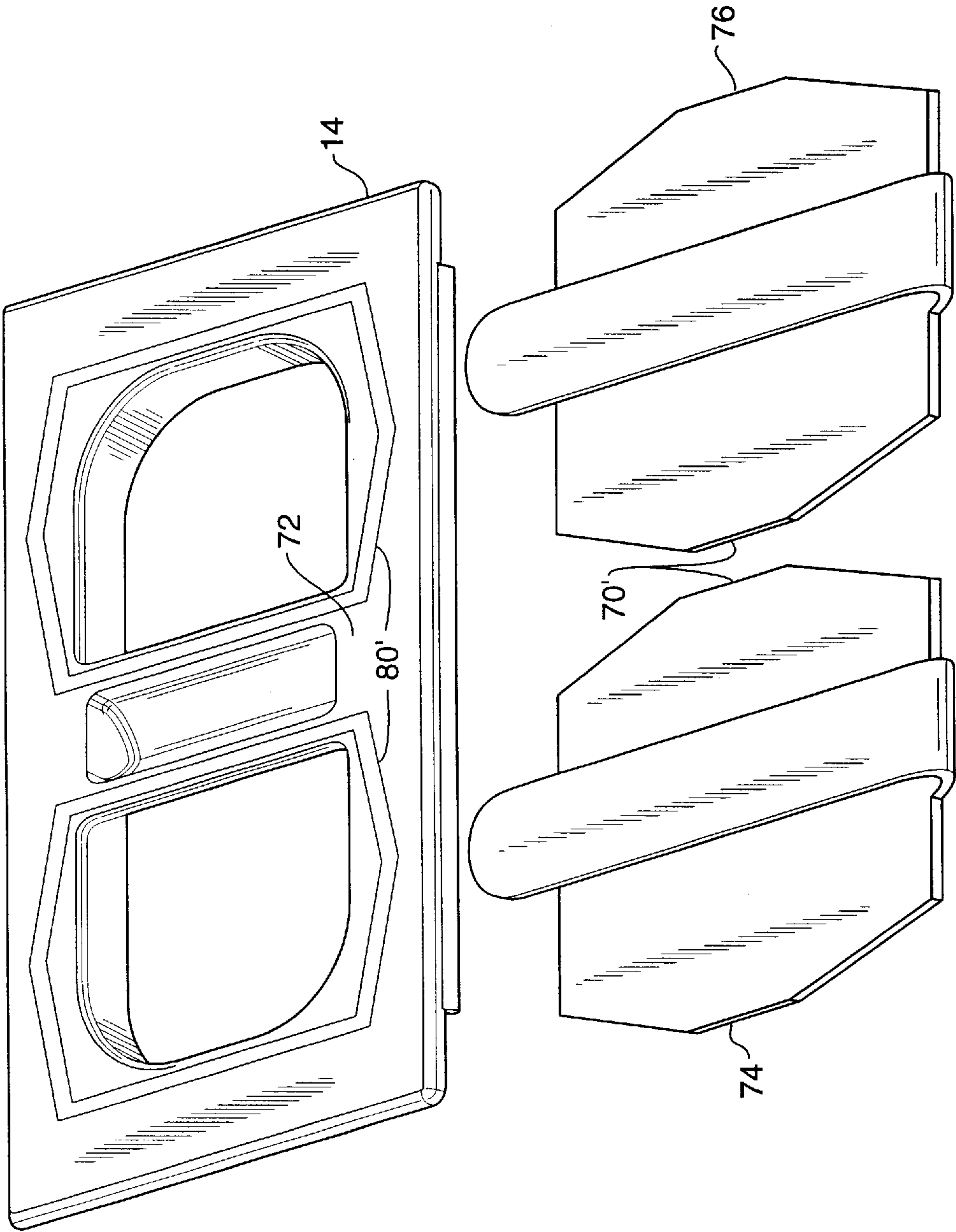


FIG. 10



## SLIDE COVER BREATHABLE SEAL FOR A MARKING PARTICLE RECEPTACLE

### CROSS REFERENCE TO RELATED APPLICATIONS

U.S. patent application Ser. No. 09/052,717, filed on Mar. 31, 1998, entitled "IDENTIFYING FEATURES ASSOCIATED WITH THE SLIDE COVER FOR A MARKING PARTICLE RECEPTACLE" in the name of Christopher S. Garcia et al.

U.S. patent application Ser. No. 09/052,686, filed on Mar. 31, 1998, entitled "SLIDE COVER FOR MARKING PARTICLE RECEPTACLE" in the name of Christopher S. Garcia et al.

U.S. patent application Ser. No. 09/052,620, filed on Mar. 31, 1998, entitled "RECEPTACLE FOR PARTICULATE MATTER" in the name of Christopher S. Garcia et al.

### FIELD OF THE INVENTION

This invention relates in general to marking particle receptacles utilized for supplying particulate material to the development station of a reproduction apparatus, and more particularly to a marking particle receptacle with a slide cover for selectively closing the receptacle and which has a breathable seal.

### BACKGROUND OF THE INVENTION

Typical commercial reproduction apparatus include electrostatographic process copier/duplicators or printers, for example. With such reproduction apparatus, pigmented marking particles are utilized to develop an electrostatic latent image of information to be reproduced on a dielectric support member for transfer to a receiver member, or directly onto a receiver member. The receiver member bearing the transferred marking particle developed image is transported through a fuser device where the marking particle image is fixed (fused) to the receiver member, for example, by heat and pressure to form a permanent reproduction.

The marking particles for developing the electrostatic latent image are supplied to the reproduction apparatus development station in a receptacle removably connected to a receiving apparatus for the development station. U.S. Pat. No. 4,972,887 (issued Nov. 27, 1990, in the names of Hacknauer et al), shows a marking particle receptacle having a particle-containing portion with a base. The base has an opening facing downward in use and a flange extending outward from the opening. A cover is slidably secured to the flange. A receiving apparatus for the receptacle includes a replenisher sump for receiving marking particles through the base of the receptacle when the opening of the receptacle is positioned directly above the sump. The receptacle with the slide cover is positioned beside the replenisher sump, and the receptacle particle containing portion is slid off the cover and over the replenisher sump, with the flange sliding on a receiving surface that surrounds an opening for the replenisher sump.

The receptacle particle containing portion is moved back over the cover, after the receptacle is emptied, to prevent the escape of residual marking particles remaining in the marking particle receptacle during removal and further handling in recycling of the receptacle. The slide cover employs a hinge to enable it to move out of the way when the receptacle is operatively located relative to the replenisher sump of the reproduction apparatus development station. A seal is

attached to the slide cover to prevent leakage during shipping and handling. However, as the size of the receptacle increases, it becomes more difficult to provide a seal which can be readily removed.

### SUMMARY OF THE INVENTION

In view of the above, this invention is directed to a marking particle receptacle and slide cover which includes a breathable seal readily removable from the receptacle. The receptacle includes a container, adapted to store particulate matter, has an opening defined therein. A flange is located about the defined opening so as to facilitate placement and removal of the receptacle with the reproduction apparatus. A breathable seal member is provided having a body portion and a readily accessible end portion. The body portion is bonded to the flange for covering the defined opening. The bond is particularly formed in a pattern of repeating minimum and maximum distances from the defined opening to reduce the forces required, on grasping the accessible portion, to break the bond and remove the breathable seal from the flange.

The invention, and its objects and advantages, will become more apparent in the detailed description of the preferred embodiments presented below.

### BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description of the preferred embodiments of the invention presented below, reference is made to the accompanying drawings, in which:

FIG. 1 is a view, in perspective, of a marking particle receptacle and a slide cover for the receptacle, according to this invention, in the open, extended position;

FIG. 2 is a view, in perspective, of a marking particle receptacle and a slide cover for the receptacle, according to this invention, in the open, folded out of the way position;

FIG. 3 is a view, in perspective, of a marking particle receptacle and a slide cover for the receptacle, according to this invention, in the closed position;

FIG. 4 is a side elevational view of the marking particle receptacle and slide cover as shown in FIG. 1;

FIG. 5 is a rear elevational view of the marking particle receptacle and slide cover as shown in FIG. 2;

FIG. 6 is an exploded view of the marking particle receptacle and slide cover shown in relation to a replenisher sump;

FIG. 7 is a side elevational view, in cross-section, of a portion of the slide cover for the marking particle receptacle, showing the hinge mechanism for the slide cover and foam seal;

FIG. 8 is a view, in perspective of the slide cover and marking particle receptacle, as shown in FIG. 1, taken from the bottom;

FIG. 9 is a view, in perspective, of the marking particle receptacle flange and the breathable seal therefor; and

FIG. 10 is a view, in perspective, of an alternate embodiment of the marking particle receptacle flange and the breathable seal therefor.

### DETAILED DESCRIPTION OF THE INVENTION

Referring now to the accompanying drawings, a particulate matter receptacle with slide cover, according to this invention, is generally designated by the numeral 10, and is best shown in FIGS. 1-6. The receptacle 10, as more fully



described in copending U.S. patent application Ser. No. 09/052,620, is of a substantially two-piece construction including a blow molded plastic container **12** and an injection molded support flange **14** joined thereto. The particular shape of the housing of the container **12** is selected to provide a maximum particulate matter storage capacity with a minimum resistance to particulate matter flow as the particulate matter fills or empties from the container.

In the particular embodiment shown herein, the particulate matter is pigmented marking particles adapted to be used as image development material in reproduction apparatus, such as copier/duplicators or printers for example. The container **12** of the receptacle **10** has several built-in features **16a-16e**. The built-in features **16a-16d** of the container **12** provide for improved handling of the receptacle and facilitate its placement and removal in a reproduction apparatus with which the receptacle is adapted to be associated. The features **16a-16d** are particularly shaped recesses formed in opposed generally upstanding front (**12f**) and rear (**12r**) walls of the container. The recesses are adapted to be readily gripped by human hands. The orientation and configuration of the recesses are selected to cause the hands to be optimally positioned for comfortably handling the receptacle **10**, and for facilitating the sliding of the receptacle into and out of the reproduction apparatus. That is, the recesses **16a-16d** are shaped to readily accommodate the thumbs and fingers of a user, respectively, in opposed relationship to provide for a secure grip on the receptacle **10**. Further, the recesses are located approximately about the center of gravity of a filled receptacle so that lifting and maneuvering of the receptacle, from a flange-on-top position (for filling and storage) to a flange-on-bottom position (for loading/unloading), is readily accomplished. The built-in feature **16e** (see FIG. 1) is also a recess formed in the upstanding front wall **12f** of the container **12**. The particular purpose of the feature **16e** will become fully apparent with reference to the explanation provided below.

A marking particle replenisher sump **30** is located in a reproduction apparatus to receive the marking particle receptacle **10**, for resupplying the development station of the apparatus with marking particles (see FIG. 6). The replenisher sump **30** defines a cavity **32** for receiving marking particles from the receptacle **10** where they are mixed and fed to a development station of the reproduction apparatus, all by mechanisms well-known in the art and not shown in detail herein. The replenisher sump **30** also includes a receiving surface **34** for receiving and guiding the bottom surface of the flange **14** of the receptacle **10** as the receptacle is moved to a position relative to the replenisher sump into engagement with locating stops **35**. Side guides **36** guide the flange **14** of the receptacle **10** as the receptacle is slid by the operator into operative position with its opening over the cavity **32**. A resilient seal **38** is located about the perimeter of the replenisher sump **30** generally alongside the entrance to the cavity **32**. Once the receptacle **10** is in operative position against the stops **35**, relative to the cavity **32**, side guides **36** hold flange **14** securely in engagement with the seal **38**.

A rigid slide cover **40**, according to this invention, is held on flange **14** by side rails **42**. The slide cover **40** is preferably formed of plastic. A leading edge reinforcing member **44** for the slide cover engages the front of flange **14** when the slide cover is properly seated on the receptacle **10**. As seen best in FIGS. 4, 5, and 7, the slide cover **40** includes a first portion **46** and a second portion **48** interconnected by a hinge **50**. The hinge **50** can be formed for example by a conven-

tional thinning of a portion of the slide cover **40**. Due to the particular hinge construction, the first portion **46** can be substantially freely rotated relative to the second portion **48**. This has particular applicability as explained below.

Additionally, the slide cover **40** includes a foam seal **60**. The foam seal **60** serves to prevent leakage of marking particles into the environment from the receptacle **10** when the receptacle is being loaded into or removed from the reproduction apparatus. The foam seal **60** (as best seen in FIG. 7) includes a layer **62** of, for example, polyolefin foam. One side of the foam layer **62** is covered with a thin sheet **64** of polyolefin for example. Such sheet **64** has a low coefficient of friction so as to facilitate sliding of the flange **14** of the receptacle **10** in the slide cover **40** and to prevent marking particles from sticking to the slide cover.

The opposite side of the foam layer **62** has a pressure sensitive adhesive coating **66** for attaching the foam seal **60** to the slide cover **40**. A paper backing layer **68** is applied to the pressure sensitive adhesive coating **66** to protect the coating from contamination. Prior to assembly with the slide cover **40**, portions of the backing layer **68** are removed. The portions of the backing layer which are left will enable the foam seal to be readily properly positioned relative to the slide cover during assembly. The removed portions of the backing layer **68** will then enable the foam seal **60** to be secured by the adhesive coating **66** to the slide cover **40** at such proper position. It should also be noted that the foam seal **60** has a groove **60a** cut into the foam from the pressure sensitive adhesive side. The groove **60a** is located so that, upon assembly with the slide cover **40**, it will substantially overlie the hinge **50**. In this manner, the foam seal **60** is readily bent when the first portion **46** is rotated relative to the second portion **48** minimizing the spring tension of the foam and reducing the necessary bending forces to be applied to the slide cover **40**.

Once the marking particle receptacle **10** is positioned over the replenisher sump cavity **32**, the slide cover **40** extends substantially outwardly from the interface of the receptacle with the cavity (in the manner best shown in FIGS. 1 and 4) in a position beside or to the side of the replenisher sump cavity. Accordingly, the slide cover **40** would be located in a position in which it can interfere with closing of the front door of the reproduction apparatus, or can lead to damage of the slide cover or other reproduction apparatus components. The slide cover hinge **50** is located across the direction of movement of the receptacle **10** relative to the replenisher sump **30**. As such, the second portion **48** may be rotated to a position shown in FIGS. 2 and 5, where it is out of the way of, and not restricting, the rest of the reproduction apparatus, i.e., it allows the front door of the reproduction apparatus to be freely closed. The slide cover **40** further includes a latch **52** which is adapted to engage the feature **16e** (described above) of the container **12**. The latch **52** is preferably of a somewhat resilient nature so as to be readily manipulated relative to the feature **16e**. Accordingly, by the cooperative association of the latch **52** and the recess of the feature **16e**, the slide cover **40** can be securely retained in an out of the way location so that damage is prevented.

When the marking particle receptacle **10** has been emptied, the slide cover **40** is lowered to its extended position. That is, latch **52** will be manually manipulated to be disengaged from the feature **16e**, and then the second portion **48** of the slide cover is rotated about hinge **50** to lie in a substantially planer relation with the first portion **46** (see FIGS. 1 and 4). The marking particle receptacle **10** can then be slid back out onto the extended slide cover **40** for removal and disposal with a minimum loss of unused marking



particles and a minimum possibility of soiling the person and clothing of the operator.

It is well known that reproduction apparatus employ marking particles of various compositions and/or characteristics depending, for example, on the particular process utilized by a reproduction apparatus. For example, a color model reproduction apparatus may be designed to take one type of marking particle composition; for example, a marking particle compatible with a fuser using other color marking particles, while another model receives marking particles adapted for a black only apparatus which may not be compatible with a fuser for the color marking particles, but may have other advantages. Also a single reproduction apparatus may utilize two colors of marking particles in development station replenisher sumps which are otherwise substantially identical, for example, a black station and a red or other color station. Further, a single reproduction apparatus may utilize magnetic black marking particles and non-magnetic black marking particles in essentially identical sumps.

In order to enable the use of common parts in association with a multiplicity of reproduction apparatus, the slide cover **40** for the marking particle receptacle **10**, in combination with the replenisher sump **30**, contains a simplified system for assuring that a receptacle containing marking particles of a particular composition or characteristic is brought into association only with a reproduction apparatus requiring such particular marking particle composition or characteristic. As best seen in FIG. 8, when the slide cover **40** is manufactured, it is provided in the leading edge reinforcing member **44** with a pair of ears **44a**, **44b** at the extremities thereof. Further the leading edge reinforcing member **44** has a series of spaced upstanding identifier ribs **44c**, **44d**, etc., located in association with the medial section thereof. Similarly, the receiving surface **34** of the replenisher sump **30** has a guide slot **34a** and a series of identifying slots **34c**, **34d**, etc. (see FIG. 6). The guide slot **34a** is of a dimension for receiving the reinforcing member **44** (and the ears **44a**, **44b**) to properly locate the slide cover **40**, and thus the marking particle receptacle **10**, in operative association with the replenisher sump **30**. The series of identifying slots **34c**, **34d**, etc., are for the purpose of receiving the identifying ribs of the slide cover member **44**.

According to the composition or characteristics of the marking particles used to fill the receptacle **10**, a slide cover will be used which has identifying ribs indicative of that particular marking particle formulation. When an operator attempts to resupply marking particles to a reproduction apparatus utilizing marking particles of a particular composition, the operator must have a marking particle receptacle **10** containing proper marking particle composition. If the identifying ribs in the slide cover align with the identifying slots of the sump receiving surface, the receptacle will be able to be properly associated with the replenisher sump to enable the receptacle to be slid into proper position above the replenisher sump. However, if an operator attempts to put a receptacle containing marking particles of a different composition into the sump, the identifying slots on the replenisher sump receiving surface will interfere with the identifying ribs of the slide cover **40** and prevent proper association of the receptacle relative to the sump.

Additionally, a seal **70** is employed over the bottom of the marking particle receptacle **10** (see FIG. 9). The seal **70** is made of a breathable material such as paper, coated paper, or plastic, for example. In the preferred embodiment, the breathable seal **70** is made of Tyvek™. The purpose of the breathable seal is to retain the marking particles in the

receptacle during shipping and handling, while allowing air to pass through such seal. This will prevent pressure differential buildups in the receptacle. Such well known seals are commonly adhesively affixed (bonded) to the bottom of flange **14** to seal the receptacle. The breathable seal **70** is attached beginning with an edge of the seal at the trailing (during insertion) edge of flange **14** and running across the opening of the receptacle to the leading edge adjacent the flange. The seal **70** is folded and doubled back upon itself to present an accessible end **70a** extending from between flange **14** and the slide cover **40**. Accordingly, the end **70a** of the breathable seal is readily accessible to the operator. After the marking particle receptacle **10** has been operatively positioned above replenisher sump **30**, and before the slide cover **40** has been moved to its retained out of the way position, the accessible end **70a** of the breathable seal **70** is pulled to remove it from the opening to allow the marking particles within the receptacle to drop into the sump cavity. The breathable seal is then thrown away.

As noted above, the receptacle **10** is configured to be larger than presently known receptacles. As a result the breathable seal **70** must be configured to be commensurately larger. With previous design configurations for a breathable seal, the force required to break the adhesive bond for removing the seal would accordingly be substantially increased. The force required to remove the breathable seal **70** from the receptacle **10** has two components. First there is the force required to break the adhesive bond of the seal to the receptacle. For any given adhesive, the removal force is dependent upon the seal bond geometry. By altering the seal bond pattern it is possible to change the amount of force needed to break the adhesive bond. The seal bond **80** has a pattern here established, according to this invention, to reduce the linear seal distance without compromising seal integrity. A sinusoidal, or saw tooth, pattern for the breathable seal bond **80** has been created to lower the removal force. A sinusoidal seal bond **80a** exists on the back and front of the flange **14** with a linear vertical seal bond **80b** between them (see FIG. 9). This seal bond configuration reduces the linear seal bond length (direction substantially perpendicular to the pull force vector) at any given point while maintaining a minimum seal bond width.

Second, since the receptacle **10** is loaded on the replenisher sump **30** and sealed thereto with the above described foam seal **60** (to insure a tight seal against marking particle leakage), the breathable seal **70** must be pulled through the foam seal. In prior arrangements, the standard practice is to seal the flange **14** on the sides of the receptacle where the breathable seal is attached. However, according to this invention, by reducing the width of the breathable seal **70** to less than the width of the foam seal **60** on the replenisher sump **30**, and keeping it inboard of the replenisher sump foam seal, it is possible to reduce the force required to remove the breathable seal. This is at least in part due to the fact that the breathable seal being pulled off the receptacle flange does not double up beneath the flange at the foam seal (which would otherwise result in additional interference creating higher pull forces). Accordingly, by eliminating the double layer of the breathable seal **70** through the foam seal **60** on the sides of the replenisher sump **30**, the removal force is also lowered.

Alternatively, a double breathable seal **70'** (see FIG. 10) can be incorporated into the receptacle flange **14** to reduce the seal removal forces. A center cross rib **72** for example is molded into the receptacle flange to enable two sheets of the breathable seal **74**, **76** (for example of the same material as described above) to be independently bonded to the flange.



The center cross rib **72** may be tapered to enable marking particles to be directed into the replenisher sump **30** without hanging up on the cross rib. Splitting the marking particle receptacle mouth into two passages allows the operator to remove a relatively smaller sheet of the breathable seal, one at a time, resulting in lower seal removal forces for each breathable seal. Thus, removal of one breathable seal at a time cuts the removal force substantially in half.

The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

PARTS LIST

- 10**—marking particle receptacle
- 12**—container
- 12f**—front wall
- 12r**—rear wall
- 14**—support flange
- 16a–16d**—built-in features
- 16e**—built-in feature
- 30**—replenisher sump
- 32**—cavity
- 34**—receiving surface
- 34a**—guide slot
- 34c, 34d**—identifying slots
- 35**—stops
- 36**—side guides
- 38**—seal
- 40**—slide cover
- 42**—side rails
- 44**—lead edge reinforcing member
- 44a, 44b**—ears
- 44c, 44d**—identifier ribs
- 46**—first portion
- 48**—second portion
- 50**—hinge
- 52**—latch
- 60**—foam seal
- 60a**—groove
- 62**—layer
- 64**—sheet
- 66**—adhesive coating
- 68**—paper backing layer

- 70, 70'**—breathable seal
- 70a**—accessible end
- 80, 80'**—seal bond

What is claimed is:

- 1. A receptacle for particulate matter to be supplied to a reproduction apparatus, said receptacle comprising:
  - a container adapted to store particulate matter, said container having an opening defined therein, and a flange located about said defined opening so as to facilitate placement and removal of the receptacle with the reproduction apparatus;
  - a breathable seal member having a body portion and a readily accessible end portion, said body portion being bonded to said flange for covering said defined opening, such bond being formed in a pattern of repeating minimum and maximum distances from said defined opening to reduce the forces required, on grasping said accessible portion, to break the bond and remove said breathable seal from said flange; and
  - a slide cover, supported by said flange for selective movement to a first position covering said defined opening and a second position uncovering said defined opening, said slide cover having a foam seal for sealing said defined opening when said slide cover is in said first position.
- 2. The receptacle according to claim 1 wherein said bond pattern is of sinusoidal shape.
- 3. The receptacle according to claim 1 wherein said bond pattern is of sawtooth shape.
- 4. The receptacle according to claim 1 wherein said breathable seal member has a dimension of a width less than the corresponding width of said foam seal of said slide cover.
- 5. The receptacle according to claim 1 wherein said breathable seal member is formed of a material selected from the group consisting of paper, coated paper, or plastic.
- 6. The receptacle according to claim 1 wherein said flange includes a cross rib dividing said defined opening into two openings, and said seal member includes two body portions and two readily accessible end portions respectively associated therewith, said body portions being bonded to said flange for respectively covering said two openings.

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